

GRAYWATER SYSTEM

Description. Graywater is untreated household wastewater that has not come into contact with toilet waste. Graywater includes used water from bathtubs, showers, bathroom wash basins and water from clothes washing machines and laundry tubs. It shall not include wastewater from kitchen sinks, water softeners, dishwashers or laundry water from soiled diapers. A graywater system consists of a separate plumbing system from the black waste and kitchen plumbing, a surge tank to temporarily hold large drain flows, a filter to remove particles that could clog the irrigation system, a pump to move the graywater from the surge tank to the irrigation field, and an irrigation system to distribute the graywater.

Conditions for Approval.

1. Graywater treatment and disposal systems must meet all the separation distance setback criteria and soil application rate criteria as found in the rules.
2. Specialized plumbing designs will need to be approved by the Division of Building Safety, Plumbing Bureau.
3. Graywater surge tanks must be watertight and non-corrosive.
4. Operations and Maintenance manuals must be provided to the owner of the property.
5. Graywater may not be used to irrigate vegetable gardens.
6. The capacity of the septic tank and size of the blackwaste drainfield and replacement area shall not be reduced by the existence or proposed installation of a graywater system servicing the dwelling.
7. Graywater shall not be applied on the land surface or be allowed to reach the land surface.

Design Requirements:

1. Graywater flows are determined by calculating the maximum number of occupants in the dwelling, based on the first bedroom with two occupants and each bedroom thereafter with one occupant. Estimated daily graywater flows for each occupant are:

Showers, bathtubs, and wash basins (total)	25 Gal./Day/Occupant
Clothes washer	15 Gal./Day/Occupant

Multiply the number of occupants by the estimated graywater flow.

Ex. Three-bedroom house will have a design for four (4) people. The house has a clothes washer connection, then each occupant is assumed to produce 40 Gallons of graywater per day, resulting in a total of 160 gallons per day.

2. The following formula is used to estimate the square footage of landscape to be irrigated:

$$LA = \frac{GW}{ET \times PF \times 0.62}$$

where: GW = estimated graywater produced (Gallons per Week)

LA = Landscaped area (ft²)

ET = Evapotranspiration (inches per week)

PF = Plant Factor, based on climate and type of plants either 0.3, 0.5, or 0.8

0.62 = conversion factor (from inches of ET to gallons per week)

Example. If ET = 2 inches per week, and lawn grasses are grown with a PF of 0.8 (high water using) then the landscaped area is equal to: LA = (160 GPD x 7 Days)/ (2 x 0.8 x 0.62) = 1,129 ft² of lawn.

3. An alternative to using graywater for lawns is to irrigate landscape plants. A plant factor is dependent upon the type of plants to be watered, an ET rate, and plant canopy. The following table can be used to calculate square footage of landscape plants that are able to be irrigated with graywater:

ET (Inches per Week)	Relative Water Need of Plant	Gallons per Week		
		200 ft ² Canopy	100 ft ² Canopy	50 ft ² Canopy
1 Inch per Week	Low Water Using 0.3	38	19	10
	Med. Water Using 0.5	62	31	16
	High Water Using 0.8	100	50	25
2 Inches per Week	Low Water Using 0.3	76	38	19
	Med. Water Using 0.5	124	62	31
	High Water Using 0.8	200	100	50
3 Inches per Week	Low Water Using 0.3	114	57	28
	Med. Water Using 0.5	186	93	47
	High Water Using 0.8	300	150	75

Gallons per week calculation for this chart was determined with the following formula:

Gal/Week = ET x Plant Factor x Area x 0.62 (Conversion factor). This formula does not account for irrigation efficiency. If the irrigation system does not distribute water evenly, extra water will need to be applied.

Example: 4 bedroom home with a washer will produce 1,120 gallons per week (7days x 160GPD). If ET = 2 inches per week, then the 1,120 gallons of gray water a homeowner could irrigate:

8 small fruit trees:	8 x 50 = 400 gallons (high water using, 50 ft canopy)
8 medium shade trees:	8 x 62 = 496 gallons (med. water using, 100 ft canopy)
7 large shrubs:	7 x 31 = <u>217 gallons</u> (med. water using, 50 ft canopy)
Total water use per week:	1,113 gallons per week

Other Requirements.

1. The Graywater Standards (UPC) require that all graywater piping be marked "Danger Unsafe Water."
2. Valves in the plumbing system must be readily accessible, and backwater valves must be installed on surge/holding tank drain connections to sanitary drains or sewer piping. Ball valves are recommended to be used in the system. Finally all piping must be downstream of a waterseal type trap(s) if no such trap exists, an approved vented running trap shall be installed upstream of the connection to protect the building from possible waste or sewer gasses._
3. Surge tank must be vented and have a locking gasketed lid. If the surge tank is within the structure, then the venting must meet the requirements of the Uniform Plumbing Code. Outside surge tanks shall be vented with a 180° bend and screened. A minimum capacity of 50 gallons is required. The surge tank must be placed on a 3-inch concrete slab or on dry level compacted soil and the lid labeled "Graywater Irrigation System, Danger-Unsafe Water." Surge tanks shall be constructed of solid durable materials, not subject to excessive corrosion or decay, and shall be watertight. The tank drain and overflow gravity drain must be permanently connected to the septic tank or sewer line. The drain and overflow drain shall not be less in size than the inlet pipe.
4. Filters with a minimum flow capacity of 25 gallons per minute are required.
5. Pumps are usually required to lift the graywater from the surge tank to the irrigation system (See pressure Distribution System Section). Alternatively if all of the landscape plants are below the building drain lines then the graywater irrigation system could use gravity to distribute the graywater.
6. Irrigation system can be either a mini-leachfield or a subsurface drip irrigation system. Mini-leachfield designs follow the rules and are required to use geotextile for the drainrock soil barrier.

Notes:

1. The following plants are tolerant of sodium and chloride ions or have been reported to do well under graywater irrigation:

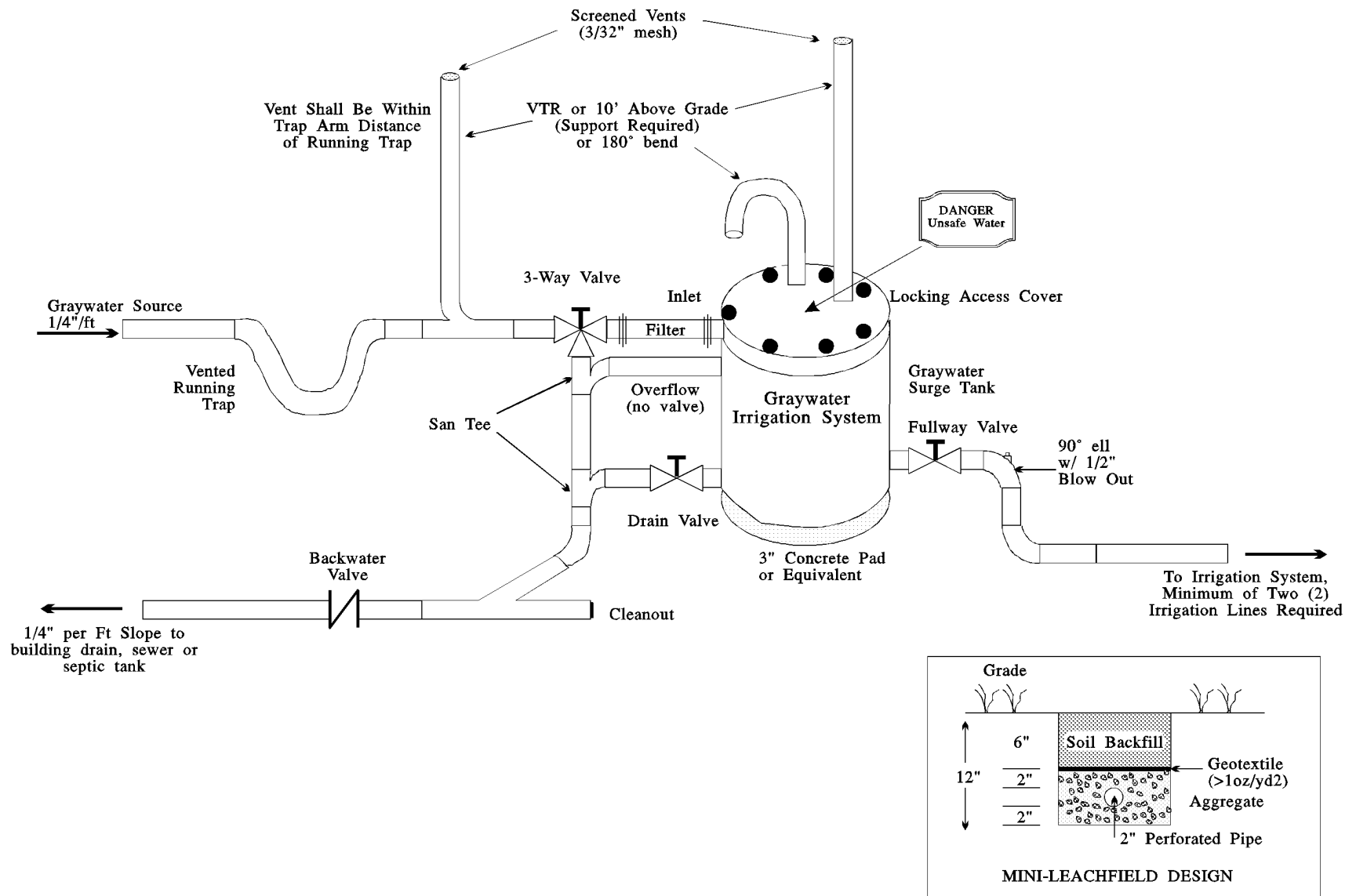
Crape Myrtle	Redwoods	Star Jasmine	Holly	Deodar Cedar
Bermuda Grass	Honeysuckle	Oaks	Cottonwood	Arizona Cypress
Oleander	Bougainvillea	Rose	Rosemary	Agapanthus
Italian Stone Pine	Purple Hopseed Bush	Olive	Juniper	Sweet Clover
Strawberry Clover	Evergreen Shrubs	Pfitzer Bush		Carpet Grass

2. Several different types of media can be used in graywater filtration. These include: nylon or cloth filters, sand filters, and rack or grate filters.

3. Mini-Leachfield Design Criteria:

Mini-Leachfield Design Criteria	Minimum	Maximum
Number of drain lines per irrigation zone	1	---
Length of each perforated line	---	100 ft
Bottom width of trench	6 inches	18 inches
Total depth of trench	12 inches	18 inches
Spacing of line, Center to Center	3 ft	4 ft
Depth of earth cover over lines	6 inches	12 inches
Depth of aggregate over pipe	2 inches	---
Depth of aggregate beneath pipe	2 inches	---
Grade on perforated pipe	Level	1 inch / 100 ft

GRAYWATER SYSTEM (Single Tank - Gravity)



GRAYWATER SYSTEM (Single Tank - Pumped)

